Owners Manual

Öhlins shock absorbers, Car Rally & Track

Including:

How the shocks works

Setting up the car

Making adjustments

Trouble shooting

Maintenance Inspection

ÖHLINS
ADVANCED SUSPENSION TECHNOLOGY

Safety signals

Important information concerning safety is distinguished in this manual by the following notations:

⚠

The Safety alert symbol means: Caution! Your safety is involved.

⚠ WARNING!

*Failure to follow warning instructions could result in **severe or fatal injury** to anyone working with, inspecting or using the suspension, or to bystanders.*

CAUTION!

Caution indicates that special precautions must be taken to avoid damage to the suspension.

NOTE!

This indicates information that is of importance with regard to procedures.

Introduction

All of Öhlins advanced suspension products are adepted to the specific brand and model. This means that length, travel springaction and damping characteristics, are tested individually just for the vehicle that you have decided to fit with Öhlins suspension.

Before installation

Öhlins Racing AB can not be held responsible for any damage whatsoever to suspension or vehicle, or injury to persons, if the instructions for fitting and maintenance are not followed exactly.

Similarly, the warranty will become null and void if the instructions are not adhered to.

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⚠ WARNING!

1. Installing a suspension, that is not approved by the vehicle manufacturer, may affect the stability of your vehicle. Öhlins Racing AB cannot be held responsible for any personal injury or damage whatsoever that may occur after fitting the suspension. Contact an Öhlins dealer or other qualified person for advice.

2. Please study and make certain that you fully understand all the mounting instructions and the owners manuals before handling this suspension kit. If you have any questions regarding proper installation procedures, contact an Öhlins dealer or other qualified person.

3. The vehicle service manual must be referred to when installing the Öhlins suspension.

NOTE

Öhlins products are subject to continual improvement and development. Consequently, although these instructions include the most up-to-date information available at the time of printing, there may be minor differences between your suspension and this manual. Please consult your Öhlins dealer if you have any questions with regard to the contents of the manual.

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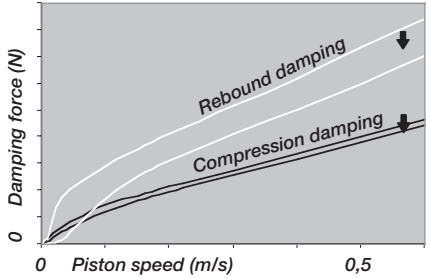
2. Damping curves

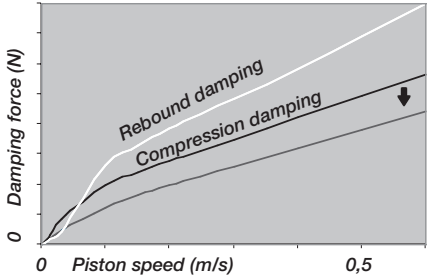
Effect of rebound adjuster (m = increased number of clicks)



1. At low shaft speeds the damping oil is forced through an adjustable bleed valve in the piston shaft. The valve affects mainly rebound damping and has only a small effect on compression damping.

2. With the bleed valve on the top of the reservoir, you adjust compression damping. The valve restricts the flow to the reservoir, not from it, thereby only influencing the compression damping.

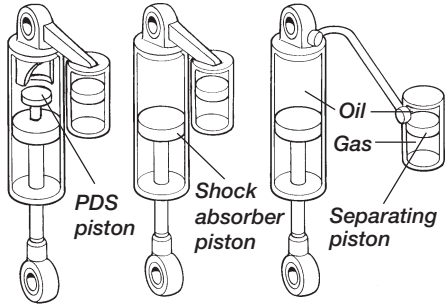
Effect of compression adjuster (m = increased number of clicks)



Design

Öhlins car shock absorbers are based on Öhlins successful application of the high pressure monotube concept. In short, that means that the damping oil is put under gas pressure, and separated from the gas by a floating piston.The separating piston is positioned in an external reservoir (Fig.1).

To obtain a progressive damping system (PDS), the most advanced shock absorber has two pistons. One of the pistons is active throughout the entire lenght of the stroke, while the second piston begins to work in the event of powerful compression of the shock absorber.



1. Shock absorber with external gas reservoir.

The high pressure monotube concept has many advantages. It prevents the risk of cavitation, that can wear out internal components and cause inconsistent damping. It eliminates aeration of the damping oil, which also causes inconsistent damping.
It improves the cooling, because the oil is in direct contact with the outer tubing. It gives more consistent damping, regardless of the shock absorber's working temperature, and it makes the shock absorber last longer.

The external shock absorber reservoir, connected directly to the shock absorber body or by a hose, is in fact an "extension" of the main body which contributes to the improved cooling. The reservoir contains the floating piston and the gas that pressurises the damping oil.

Function

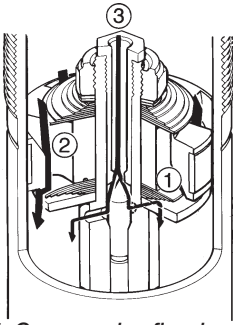
At low shaft speeds the damping oil is forced through an adjustable bleed valve in the main piston shaft. The valve affects mainly rebound damping and has only a small effect on compression damping, see fig 1, graph 1 above.
The adjuster is connected to the valve via an aluminium shaft, that runs inside the piston shaft. When the temperature in the shock increases the aluminium shaft extends, thereby closing the bleed valve gradually.

This diminishes the influence of the oil viscosity changes due to temperature, keeping the flow through the valve virtually the same, regardless of temperature.

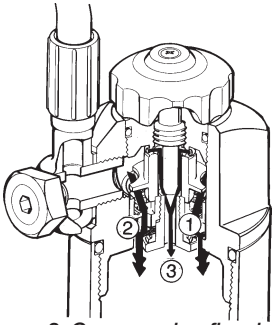
With the second adjustable bleed valve, on the top of the reservoir, you can adjust the compression damping. Some models have separate high and low speed compression clamping.

The valve restricts the flow to the reservoir but not from it, thereby only influencing the compression damping, see fig 2, graph 2 above.

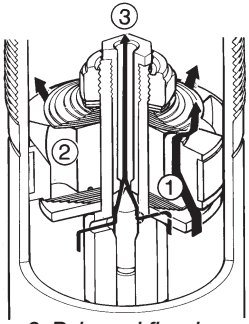
At higher shaft speeds the damping forces are primarily controlled by the main piston and its compression and rebound shim stacks. By changing the numbers, diameter, and thickness of the shims in the stack and by using different jets in the valves, your Öhlins shock absorbers are tailor-made for just your car.



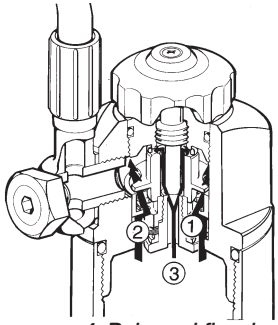
1. Compression flow in shock absorber body



2. Compression flow in external reservoir



3. Rebound flow in shock absorber



4. Rebound flow in externa reservoir

When you are driving

On a smooth surface

When you are driving on a smooth surface and the shock absorbers are compressed slowly (low shaft speed), the damping oil is forced only through the adjuster valve in the piston shaft, (Fig.1), flow 3.

The oil displaced by the piston shaft is forced through the independent compression damping adjuster out into the external reservoir, (Fig.2), flow 3.

The floating piston in the reservoir is forced to move, compressing the gas behind it further.

When the shock absorber extends, the pressure behind the floating piston will force the oil through a one-way valve, and back into the shock absorber body, (Fig.4), flow 1 and 2.

The oil beneath the piston returns through the adjuster valve in the piston shaft, (Fig.3), flow 3.

Hitting a bump

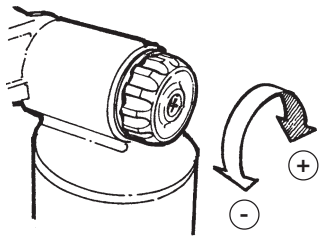
When you are hitting a bump the shock absorbers are compressed fast (high shaft speed). The oil can not be forced ”fast enough” through just the valve in the piston shaft. The pressure on the compression side increases and opens the shim stack covering the compression orifices in the piston, (Fig.1), flow 2.

Also, oil displaced by the piston shaft can not be forced ” fast enough” through just the valve in the reservoir. The pressure increases and a shim stack, parallel to the valve, opens, (Fig.2), flow 1 and 2. The floating piston is forced to move, compressing the gas by the displacement of the piston shaft.

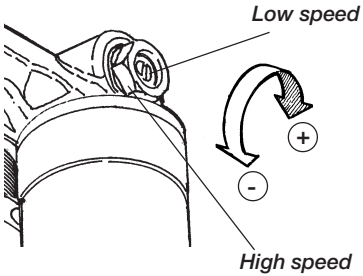
When the shock absorber extends, the floating piston forces the oil through the one-way valve back into the shock absorber body, (Fig.3), flow 1 and 2.

The pressure difference over the piston is still high and the flow can not be forced ”fast enough” through just the valve in the piston shaft. The shim stack covering the rebound orifices in the piston opens and the oil returns, (Fig.4), flow 1.

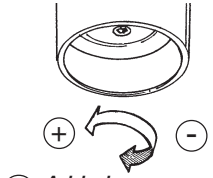
5. Adjustment of compression damping



6. High and low speed compression damping adjusters



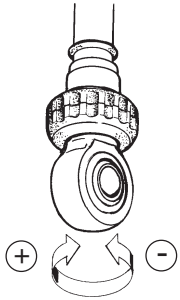
7. Rebound adjuster on Mc Pherson strut



+ *Added damping force*

- *Reduced damping force*

8. Rebound adjuster on piston shaft



External adjusters

The Öhlins shock absorbers have a low speed compression adjustment knob located on top of the reservoir (Fig.5). Some models even have a high and low speed compression adjustment (Fig.6).

A low speed rebound adjuster is located in the bottom end of the Öhlins McPherson strut. Adjustments are made with a 3 mm Allen key (fig 7).

On the Öhlins shock absorber, the rebound adjustment knob is located at the end eye of the piston shaft (Fig.8) .

The temperature compensation system of the rebound adjuster reduces the number of clicks (due to the elongation of the aluminium shaft, as described earlier) when the shock absorber is hot.

Therefore, always make changes from the previous click position without first closing the adjuster.

To count the number of clicks you are using, first let the shock cool down to ambient temperature.

NOTE!

Using to much force when closing the adjuster will destroy important sealing surfaces. When possible use no tool, simply your fingers.

All the adjusters have a normal right-hand thread. Click position zero (0) is when the adjusters are turned clockwise to fully closed.

⚠ WARNING!

There is no stop telling when the adjusters are fully open. It is possible to unscrew the strut rebound adjuster if more than the recommended usable clicks are used. Please see "Setting up your car".

Setting up your car

Installing new shock absorbers may alter ride height, wheel angles etc. on your car. Therefore, it is wise to do a complete resetting of the car after you have installed the Öhlins shock absorbers.

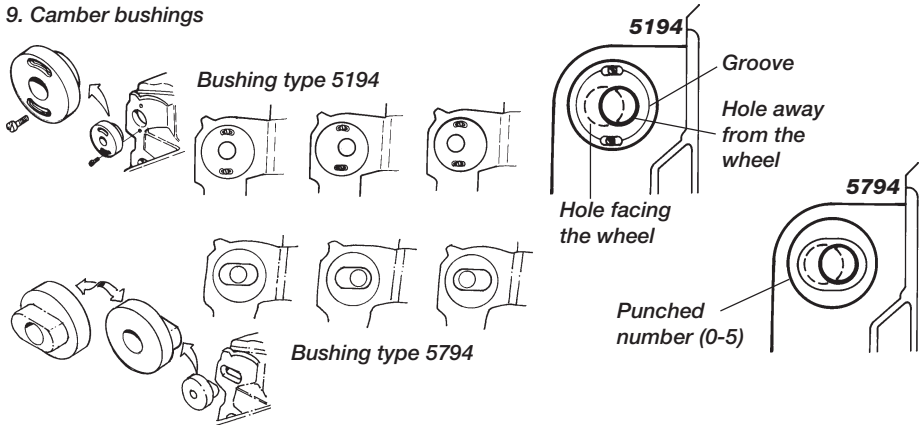
Perform the following steps and always make notes before using the shock absorber:

1. Check ride height front and rear.
Adjust if necessary.

2. Check corner weight front and rear,if scales are available.
Adjust if necessary.

3. Check all wheel angles front and rear.
Adjust if necessary.

9. Camber bushings



Camber bushings available

Bushing type 5194			Bushing type 5794	
Part no.	Marking grooves	Eccentricity in mm	Part no.	Eccentricity in mm
05194-00	0	0	05794-00	3.00
05194-05	1	0.5	05794-01	2.44
05194-10	2	1.0	05794-02	1.88
05194-15	3	1.5	05794-03	1.32
05194-20	4	2.0	05794-04	0.76
05194-25	5	2.5	05794-05	0.20
05194-80*				

*No hole, the customer can drill the hole to tailor camber exactly.

Camber bushings

Unlike most standard McPherson struts, the Öhlins struts feature camber bushings that enable you to alter the wheel camber.

The different bushings are marked: bushing type 5194 with grooves; bushing type 5794 with a punched number on the side (last figure of the Part No.).

Depending on how you mount the bushings, with the eccentric hole facing the wheel or away from the wheel, different camber angles will be obtained.

Recommended settings

The shock absorbers in your kit are adjusted to the Öhlins recommended setting for your car, see Mounting instructions. We advise you to use this as your start setting.

Making adjustments

Suspension settings are dependent on your car's weight, your driving style, road conditions etc. If you are not happy with our recommended settings, here are a few guidelines and ground rules how to make adjustments.

To make improvements, it is important to understand the function of the shock absorbers and through testing learn how they affect the handling of your car.

Always start with the Öhlins recommended settings, see "External adjusters" and "Recommended settings".

NOTE!

Higher click numbers give less damping force.

When making adjustments; keep notes, make adjustments one at a time and in small steps.

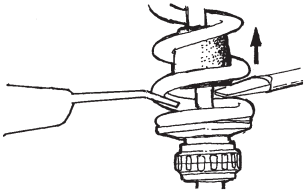
The adjusters should normally not be adjusted in steps of more than 2 clicks at a time and not outside the usable click range.

When you think you have made an improvement, go back to what you started with and double check to be sure. Pay attention to changes in conditions like tires or temperatures, etc.

In general, compression damping changes should be used to influence the car's stability and response, while rebound damping changes should be used to influence comfort and traction.

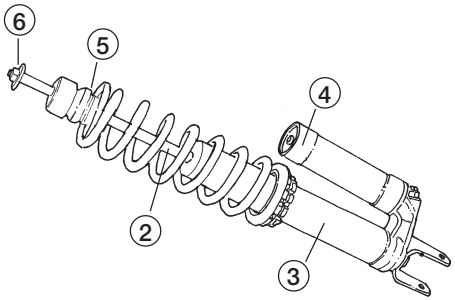
When you need more damping force, you should mainly try to increase compression damping and use as little rebound damping as possible.

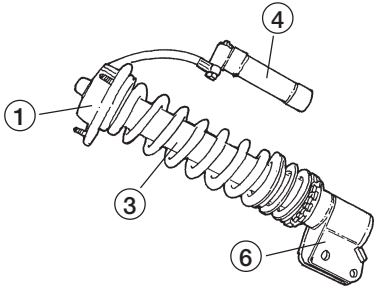
This usually means that you gain comfort and handling performance.



Lift the bump rubber and clean the area below.

Inspection points:





Inspection and maintenance

Clean the shock absorbers externally with a soft detergent . Use compressed air . Be careful that all dirt and debris is removed.

Lift the bump rubber and clean the area below.

Keep the shock absorbers clean and always spray them with oil (QS 14, WD40 or CRC 5-56 or similar) after washing the vehicle.

CAUTION!

Never use detergents that can damage the surfaces of the shock absorber. IA thinner and brake cleaner will dry the surfaces too much.

⚠ WARNING!

Never alter the gas pressure. Special-purpose charging equipment and access to nitrogen is required. The gas pressure should normally never be altered.

After every competition:
Inspection points:

1. Check brackets for possible excessive play.
2. Check the piston shaft for leakage and damage.
3. Check the shock absorber body and for external damages.
4. Check the external reservoir for damages that can restrict the floating piston from moving freely.
5. Excessive wear of rubber components.
6. Fastening to the vehicle.
7. Check the hose for leakage and damage.

NOTE!

Make certain that your shock absorber are always filled with Öhlins High performance shock absorber oil

Every 300-500 km (Mc Pherson struts only):

A. Remove the cartridge from the front outer tube by removing the bottom nut.

B. Clean all parts with a soft detergent.

C. Lubricate the the inner tube and the scraper with a layer of Öhlins red grease, part No. 146-01 (100 grams) or 146-02 (400 grams). The space between the bushings in the outer tube should be filled with a layer of Öhlins red grease up to the bushing surface.

D. Assemble the strut and tighten all nuts.

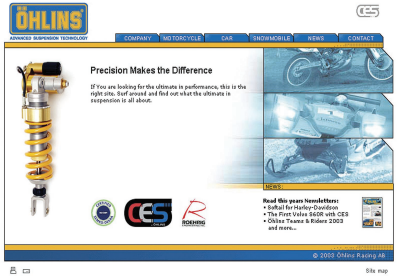
Once a year:
Change shock absorber oil. Use only Öhlins shock absorber oil. Contact your Öhlins dealer.

NOTE!

Discarded Öhlins products should be handled over to an authorized work shop or distributor for proper disposal.

More info

www.ohlins.com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• The First Ohlins S60S with CES
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